Informal knowledge exchanges under complex social relations: a network study of handloom clusters in Kerala, India

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INFORMAL KNOWLEDGE EXCHANGES UNDER COMPLEX SOCIAL RELATIONS

A NETWORK STUDY OF HANDLOOM CLUSTERS IN KERALA, INDIA[1]

Robin Cowan[2] and Anant Kamath[3]

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ABSTRACT

When agents use informal interaction to exchange knowledge, their production relations may develop as emergent properties of their social relations and may exhibit homophily. The Saliyar community cluster in India is an archetype of this. This cluster's experience is investigated on how its thickly homophilous networks have steered it from dominance to decline, in the market for a product which calls for constant improvement of know-how, under unchanging production technology. A network analysis of the Saliyars community cluster — in comparison with the networks of the communities in a cluster of a similar population at Payattuvila, which has surged ahead of the Saliyar Cluster in performance in handloom weaving — provides evidence that it is not simply social embeddedness alone, but the homophily in socially embedded links that are detrimental to clusters dependent upon informal knowledge exchanges. Hence, we provide evidence that social embeddedness is not as detrimental unless *combined* with homophily. The conceptual ambit of embeddedness has to broaden out to recognise that social relations come in various 'homophilies'. This has many policy implications too as it involves studying embeddedness and homophily in rural traditional technology clusters intensively involving community social capital; such clusters being ubiquitous in India and whose experiences have not been scrutinised in this perspective.

KEYWORDS: Clusters, Handloom, Networks, Social Embeddedness, Homophily, Kerala

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1. Introduction

Major parts of any economy, no matter how modern, are comprised of non-high-tech industries. In Europe (EU-27), for example, employment in high tech manufacturing and services comprise only about three and a half percent of total employment. The absence of high technology, however, does not imply the absence of innovation. And indeed, since Griliches (1957), there has been extensive enquiry on knowledge exchanges in low-technology settings. Often, these exchanges occur in environments where social relations hold sway and where social networks serve as valuable channels of information and knowledge exchange, providing both opportunities and constraints for firms, and directing their business alliances (Gulati, 1998). A sizeable body of literature has been devoted, over the last few decades, to studying the social embeddedness of production and business networks. The general line of argument has been that 'embeddedness' implies that economic relations are rooted within, and are emergent properties of, social relations. At the same time, study of social networks, both as the infrastructure for knowledge exchange and in and of themselves, has drawn attention to the property of homophily — the tendency of individuals to associate disproportionately with those similar to themselves. Not only do social networks tend to exhibit homophily, but the degree and nature of homophily has been found to affect the performance of a network in terms of knowledge flows (Jackson, 2008; Lazarsfeld and Merton, 1954). But at times, homophily might also permeate socially embedded production and information networks. That is, a "knowledge link" between two agents may or may not be embedded in a social link, but additionally, it may or may not be homophilous. This potential interaction between homophily and embeddedness has not been investigated in the literature on embeddedness, and an appreciation of it might lead us to a broadened understanding of social embeddedness as such. In this paper we work towards understanding this embeddedness-homophily connection with the support of a case study of the decline of a formerly dominant handloom weavers' community in India – the Saliyars at Balaramapuram town. We investigate the Saliyars' business, social and information networks to understand their decline, and apply their story to broaden our conceptual understanding of social embeddedness and homophily.

The Saliyars at Balaramapuram (a town reputed for handloom weaving, located at the southern tip of Kerala state in India) are traditionally a weaver community. Handloom clusters across Balaramapuram specialise in weaving cotton textiles in a style unique to Kerala where antiquity of weaving technology and product design form the basis of consumer demand.[4] Abandoning the traditional technology or upgrading to electric 'powerloom' would *endanger* the industry and consumer demand. But this does not imply that there are no avenues for diffusion of new knowledge; on the contrary, it may be even more imperative to share new knowledge given this atypical constraint of unchanging production technology. It is in this environment that the decline of the Saliyar community, who were once the dominant weavers in the region, is investigated. Their experience

[4] In this regard, handloom in Kerala resembles the batik industry in Bali. See for example, Hassler (2005).

demonstrates how thickly homophilous social and production networks, resting on a community's historically-rooted social capital, often argued to enrich knowledge flows, can adversely affect its dominance and lead it to eventual decline.

A network analysis of the Saliyars community cluster — in comparison with the networks of the communities in a cluster of a similar population at Payattuvila, which has surged ahead of the Saliyar Cluster in performance in handloom weaving — provides evidence that it is not simply social embeddedness alone, but the homophily in socially embedded links that are detrimental to clusters dependent upon informal knowledge exchanges. By means of this network study, we conclude that the conceptual ambit of embeddedness must broaden, since social cohesion is a combined effect of both embeddedness and homophily. From the point of view of the research on informal knowledge exchanges, this allows for a study of embeddedness and homophily in rural traditional technology clusters who intensively involve social capital; these clusters being ubiquitous in India and whose experiences have not been scrutinised in this perspective. We first review the three theoretical concepts that form the basis for this study.

2. Theoretical Concepts

2.1. Social Capital

The economic agent is shaped by his social environment, and contributes to shaping it in turn. Social relationships tie economic agents in a 'multiplex' manner (Portes, 1995), and determine their choices of partners for interaction (DiMaggio and Louch, 1998). Norms and values drive individuals to behave such that they are obliged to support, and are dependent on economic exchange with, their social connections (Portes, 1995). The exchanges entailing these connections emerge as assets in their own right, termed 'social capital' (Burt, 1997a), the first conceptual pillar of this study. Sociologists such as Weber and Hume proposed the idea that society, over other things, provides the individual with resources that help him overcome economic problems (Esser, 2008:47), but Castiglione et al. (2008) list James Coleman and Pierre Bourdieu as the first who (independently) systematised the concept. Portes (1998) explains, how, despite the many differences in the way social capital is defined and dissected, there is a consensus that it "stands for the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (Portes, 1998:6). Dasgupta (2005:S10) interprets social capital to mean, simply, interpersonal networks, recognising that networks can "remain inactive or be put to use in socially destructive ways" and that the determinant of their quality is the use to which it is put by members. Hence, the 'capital' in social capital by itself does not yield any results unless it rides on an effective network: "social capital does not bind or bridge...it is the nature of the social networks that bind, bond or bridge" (Lin, 2008:62). The network perspective is crucial to the study of social capital since agents are purposeful and their motivations, opportunity

sets, and restrictions are influenced by the network in which they reside (Portes, 1995; García, 2006); so much so, that Lin (2008) labelled social capital as essentially a 'network-based' concept. But the literature has also cautioned not to *equate* social capital with social networks, i.e., social networks are necessary for the acquisition, evolution and utilisation of social capital, but not sufficient: "resources by themselves are *not* social capital; the concept refers instead to the individual's ability to mobilise them on demand" (Portes, 1995:12). Agents' actions are what make the capital, made available by the network, effective (Akçomak, 2009).

Portes and Sensenbrenner (1993) list the sources of social capital as value introjection, transactions based on reciprocity, bounded solidarity, and enforceable trust. Lin (2008) identifies structural position (an agent's position in the social hierarchy), network locations (an agent's location in the network), and purposes of action (for maintaining solidarity, social cohesion and well-being) as its sources.[5] Coleman (1988) explains the distinct public good character of social capital; how, in many cases, agents in a network who generate social capital usually capture only a fraction of its benefits, which leads to both free-riding by some and underinvestment by others. Hence, Coleman proposes, most forms of social capital emerge not out of direct action but as by-products of routine activities; and that it resides not only within the family, but in the entire community, its structure of relations, its institutions, and the relationships the individuals' family maintain with all these. Communities and families often transfer 'cultural values' to offspring in abundance, even if only to see them survive and be preserved (Dasgupta, 2005). Long-established network links shaped along ethnic lines are also preserved across generations, which causes them to remain multipurpose, dense, and resilient, making entry into and exit from them almost impossible (Wintrobe, 1995). Agents are, therefore, 'locked-in' from birth (Dasgupta, 2005:S12) and the opportunity cost of making new links are high given that old links are inherited, ingrained and based on strong kinship values, and difficult to severe when inconvenient.

The literature on immigrant communities and ethnic enclaves (e.g. Aldrich and Waldinger, 1990; Portes, 1995; Fong and Isajiw, 2000) is elaborate on the theme of kinship and friendship, showing how networks within and around ethnic communities have immense influence on individuals' economic and social outcomes. Residential clustering, much like the Saliyar cluster, builds up a local ethnic market with a 'co-ethnic clientele' (Aldrich and Waldinger, 1990:123). But though the Saliyars may exhibit many features of immigrant and ethnic enclaves such as inherited links and kinship values, they are not exactly 'immigrants', having resided in Balaramapuram for more than a century now. What they probably are is a network 'clan' (Bianchi and Bellini, 1991) where transmission of orders is not based on market signals such as price or on account of hierarchical commands, but due to traditions or informal regulations.[6]

[5] See Esser (2008) and Akçomak (2009) for sources of social capital and a systematic representation of forms.
[6] Ouchi (1980) elaborated on the 'clan' concept to "identify a social group based on solidarity among participants, self-identification as a collective unit, common language, and sharing of basic knowledge and

Cohesion is an important stimulator of social capital. Cohesive ties foster cooperation (Coleman, 1988) and permit a shared culture and strong collective identity, necessary for loyalty and long term stability (Perry, 1999). But the literature abounds with warnings about its detrimental effects. Burt (1992) points out that cohesion may be a source of rigidity, and may not assist an agent in flexible adaptation to changes in his economic or social environment. In fact, a firm's organisational inertia might be a consequence of its position in a cohesive and rigid network and not necessarily due to its internal or intrinsic failings (Walker et al., 1997). Since cohesive contacts are likely to have similar information, redundancy in information sources is very likely (Burt 1997a,b). What may therefore be more effective than cohesiveness is the strategic capture of sparse regions in networks, and utilising weak links (Granovetter, 1973). It is well known that network positions associated with the highest economic returns lie not in densely connected regions, but in sparse regions that provide opportunities for brokering information flows and creating the potential for arbitrage in markets (Burt, 1992; Walker et al., 1997). Hence, "the more [structural] holes spanned, the richer the information benefits of the network" (Burt, 1997a:341). Cohesion is certainly 'safer', but safety may not always be the right strategy for accessing and exchanging new knowledge. The agent's role in a fluid task environment, therefore, is to make the right balance between rigidity through cohesiveness and flexibility through bridging structural holes, in the manner of a 'tightrope walker' (Gargiulo and Benassi, 2000:194). Highly dense and closed ego networks, plus with a fair share of weak ties linking them with other networks, benefit the most (García, 2006).

2.2. Social Embeddedness

Economic exchanges are essentially an emergent property of the social structure in which the economic agents are embedded (Uzzi, 1997). The second conceptual pillar of this study – social embeddedness (or simply, embeddedness) – relates to the idea that "behaviour and institutions to be analysed are so constrained by ongoing social relations that to construe them as independent is a grievous misunderstanding" (Granovetter, 1985:482), and consequently that economic decision-making is the result of a multitude of factors, rooted in a variety of settings, and never just a question of simple cost-benefit analysis (Dankbaar, 2004). The concept of embeddedness shares the same basis as social capital, in the weakness of 'immediate utility' in explaining social relations, the logics underlying the formation of institutions and norms, and the fact that these cannot be removed from the social, cultural and cognitive contexts and identities in which they are implanted (Ghezzi and Mingione, 2007). In most low-tech rural and traditional industries, where knowledge exchanged is mostly uncodified, a large proportion of new know-how is gathered through close social ties; often

values" (Bianchi and Bellini, 1991:490). Ouchi revealed that he developed this concept based on Durkheim's conceptualisation of an organic association resembling a kin network, but not necessarily including blood relations, therefore including almost any occupational group displaying a sense of organic solidarity and embracing legitimate authority, upholding reciprocity and a common belief and value system, and tradition.

even preferred over formal (and sometimes cost-free) sources of information such as visual or print media (Uzzi and Lancaster, 2003); hence, studying knowledge exchanges in these environments without studying the social ties they are embedded in, is erroneous. Granovetter was a significant proponent of the concept of embeddedness, his 1985 work having been revisited a number of times across the literature. Uzzi has also contributed significantly in formalising this concept and expanding its theoretical underpinnings, the concept now enjoying "a privileged – and as of yet, largely unchallenged position as the central organizing principle of economic sociology" (Krippner, 2001:775).[7]

Embeddedness has been disentangled on relational and structural terms (see Zukin and DiMaggio, 1990; Gulati, 1998; Rowley et al., 2000). There are also extremes: while 'under-embedded' agents fail to exploit their external networks into economic advantage, thereby depriving themselves of the supportive tissue of social practices and institutions, 'over-embedded' agents' commitments to their associated community or social groups prevents them from accessing and exploiting opportunities in the external markets (Grabher, 1993a; Schnell and Sofer, 2002).

Embeddedness generates a standard of expected behaviour that obviates the need for policing (Granovetter, 1985), since information on bad behaviour passes rapidly across networks, downgrading the deviant firm and probably excluding it from information exchanges. Hence, the logic of opportunism is shifted towards the logic of trustful cooperative behaviour (Uzzi and Lancaster, 2003), which quickens decision making, enhances organisational learning and reduces monitoring costs (Uzzi, 1996 and 1997). These findings are based on Uzzi's (1997) ethnographic work on the garment manufacturing industry in New York, which shows how embeddedness offers many advantages that price alone as an indicator would not, and how eventually an embedded network organisation dominates a merely competition based processes. Dore (1983) provides similar evidence from Nishiwaki, a weaving town in Japan, on how 'relational contracting' due to embeddedness built up relationships of trust and mutual dependency, allowing for a more rapid flow of information.

One of the most important findings in the embeddedness literature is that its advantages do not last over a long term and with increasing intensity, the evident reason being that beyond a point it cuts agents, or groups of agents, from sources of information outside the established network which would in all probability have fresh opportunities and innovations. Reciprocal loyalties and obligations with local partners would take precedence over 'looking at the larger picture', severely affecting both the exchange of knowledge as well as of goods (Masciarelli et al., 2010). Ties that bind would become "ties that blind" (Grabher, 1993a:24), resulting in 'relational inertia' and 'strategic gridlock' (Duysters and Lemmens, 2003) and redundancy in the group's resource pooling (Uzzi, 1996 and 1997). This has been found particularly in ethnically-demarcated industries such as the Israeli-Arab firms in Israel who are over-embedded in their local milieu due to which kinship support structures have taken

[7] Krippner describes the legacy of embeddedness, from Polanyi, to Parsons, to its current theoretical position.

primacy over innovation, obstructing even minor organisational changes (Schnell and Sofer, 2002). Exogenous shocks grievously destabilise the network when embeddedness acts beyond a threshold (Uzzi, 1997) – the watch industry in Switzerland in the 1970s (Glasmeier, 1991) and the Ruhr region in Germany in the early 1980s (Grabher, 1993b) being two cases in point. Grabher shows in that the Ruhr, the 'dependent supplier syndrome' could not be solely faulted for decline since shortcomings in the boundary-spanning functions applied to almost all classes of industries at all levels of technology. Instead, it is personal cohesiveness and long standing relations within coal, iron, and steel industries in the Ruhr that led itself into a trap. It then follows that there must exist some theoretical optimum between over-and under-embeddedness to facilitate a firm's adaptive capacity (Uzzi, 1996). At this optimum, while a firm's arm-length ties can act as channels for gathering public information from diverse agents, embedded ties can extract from the experienced knowledge pool to draw out novel and private information (Uzzi and Lancaster, 2003).

However, the literature has also provoked the idea that social embeddedness is not a monolithic entity and can be dissected into various components or classified into categories. Schnell and Sofer (2002), for instance, recognise that social links are combinations of various elements such as kinship, a supportive tissue, and so on, and not just one single entity. Gulati (1998) recalls from Zukin and DiMaggio (1990), facets of embeddedness as having consequences for strategic alliances, *independently and together*, which need to be examined. These facets — institutional, cultural, and political elements — can be used to define embeddedness of firms in a clearer sense than simply 'social relationships'. Moody and White (2003) also mention how, like 'solidarity', 'embeddedness' is multidimensional.

2.3. Homophily

The third conceptual pillar of this study, closely related to embeddedness, is the concept of homophily, the "tendency of agents to be linked to other agents with similar characteristics" (Jackson, 2008:1), or, the tendency of individuals to associate disproportionately with those similar to themselves (Golub and Jackson, 2009), the similarities being in attributes such as beliefs, education, social status, and so on. In other words it is the principle that "a contact between similar people occurs at a higher rate than among dissimilar people" (McPherson et al., 2001:416), or the "degree to which a pair of individuals who communicate are similar" (Rogers, 2003:135). Though the adage 'birds of a feather flock together' has been common for centuries, *homophily* as a term was concretised and conceptualised only over the last sixty years. Most studies point to Lazarsfeld and Merton (1954) as the first who employed it, but there are differing opinions on this. [8] In any case, it has gained repute as one of the most pervasive and robust tendencies of social networks (Golub and Jackson, 2009). Most measures of homophily are closely related to the in-group/out-group ratio based on Wasserman and

[8] Rogers (2003) points to Gabriel Tarde's work in 1903 while Freeman (2004) points to Peter Blau's 1977 work.

Faust (1994). Currarini et al. (2009) also demonstrate the use of different measures of homophily and their various utilities and applications.

Rogers (1995 and 2003) explains that homophily and effective communication sometimes assist each other, overcoming hindrances due to differences in social status, beliefs, language, and so on, which may potentially distort meanings of messages: "When [agents] share common meanings, a mutual subcultural language, and are alike in personal and social characteristics, the communication of new ideas is likely to have greater effects in terms of knowledge gain…When homophily is present, communication is therefore likely to be rewarding to both participants in the process" (Rogers, 1995:19). By contrast, he continues, heterophilous links cause agents to seek opinion leaders of higher status in terms of education, exposure, change-agent contact, technical competence, and so on. Jackson (2008) discovered that with increasing homophily, average distance and diameter of the network do not fall, but clustering increases. Golub and Jackson (2009) also show that homophily does not affect the average path length in the network, but communication processes across the network slow down, even if only a small group displays strong homophily. With the average agent preserving a greater fraction of its links with other similar agents, the result is a localisation in the diffusion of any information that flows through the community (McPherson et al., 2001; Golub and Jackson, 2009).

There is hence a threshold beyond which embeddedness and homophily are detrimental, and over-reliance on social capital is blinding. We have seen that the decline of an agent's or a group's performance may not be due to internal factors but often due to its position in a rigid network. To investigate whether all these observations hold for clusters operating on and whose existence is defined by traditional technologies, we proceed to study the networks of the Saliyars.

3. Overview of Handloom and the Saliyars of Balaramapuram

Before beginning the network study, we provide a brief overview of the handloom industry, the Balaramapuram cluster, and the Saliyars. The Indian textile industry contributes roughly 20% of rural Indian industrial production, around a third of total exports, and has been a significant foreign exchange earner (Niranjana and Vinayan, 2001; Soundarapandian, 2002). Handloom textile production – constituting 20% of total textile production – is the second largest employer in India, employing some 6.5 million people (of whom 60% are women) on 3.8 million looms (Hanveev, 2006; MoT, 2010). In Kerala state, the industry employs around 100,000 people, concentrated in Trivandrum district in the south (which hosts 42% of all weavers in the state), and Kannur district in the north (GoK, 2009, 2010). Many producers are affiliated with cooperatives, while others operate

either independently or under master-weavers.[9] Procurement and marketing are undertaken primarily by State agencies such as Hantex and Hanveev. The Geographical Indication (GI) Tag with Intellectual Property protection for ten years was granted to the 'Balaramapuram *sari*' in January 2010 by the Government of India (MoT, 2010). Ninety four per cent of the handloom industry in Kerala is under cooperatives, with the largest number of cooperatives in Trivandrum district (GoK, 2010), but most registered cooperatives are either non-existent or non-functional (Niranjana and Vinayan, 2001). Hence, most weaving in this district, including in Balaramapuram town, is mostly under a master-weaver's unit or at the weaver's residence with production shared by the whole family – a feature common across India.

Handloom weaving in Trivandrum district is many centuries old. In the early 1800s, the Maharaja of erstwhile Travancore[10] built up a weavers' cluster of various communities at Balaramapuram town (Hanveev, 2006). The Saliyars were invited to Balaramapuram in the 1890s by the then Maharaja, along with a few families from four other Tamil-speaking communities, to locate in Balaramapuram town, and to serve as weavers to the royal family, with official patronage. They were settled on a set of streets, which was, and still is, surrounded by socially heterogeneous agglomerations of other predominantly Malayalam-speaking weaving communities. They operated as the dominant weaving community in the region for a long time (at least until the 1970s according to an elderly member of the community), mingled mostly within their community for business and social relations though they held no animosity towards other communities. This contrasted with the rest of the region where there was tremendous inter-community interaction for production and knowledge exchange between weavers, plyers, beamers, spinners, dyers, yarn sellers, and others. Over time, the dominance of the Saliyars as handloom producers gradually decayed. There is no single dominant weaver community in Balaramapuram today, but the position of the Saliyars in weaving has eroded to the point that they are now mostly involved in pre-weaving activities. The population of Saliyars engaged in weaving, or for that matter any handloom related activity, has declined dramatically. This community is no longer synonymous with the product.

The total population of the Saliyar community in Balaramapuram today, according to local government sources, is almost 1000, residing in over 300 households. But the number of Saliyar households in this cluster who deal with handloom production today is just under thirty, and most of them now are involved in pre-weaving activities such as plying. A few members of the older generation have recently retired altogether. The Saliyar cluster is located in the south-centre of Balaramapuram town. While until even forty years ago the Saliyar cluster had a pit loom at each house, there are today only a tiny handful of households with pit or fly-shuttle looms undertaking

[9] A master weaver is an entrepreneur of sorts who manages (often owns) a handloom textile manufacturing unit. Looms (numbering from three or four to almost 100) are operated under one roof, employing labour and producing on a large scale.

[10] The state of Travancore occupied most of southern modern-day Kerala state and a few regions in Tamil Nadu.

weaving as a profession. Business and family links with a town called Valliyur (near Nagercoil town in southern Tamil Nadu state, around fifty kilometres from Balaramapuram from where most Saliyars in Balaramapuram trace their ancestry) are still maintained, as are links with small firms in Surat (a major town in Maharashtra state in western India, hundreds of kilometres away) for gold thread, and with Muslim beamers in Trivandrum district. Production at almost all stages uses traditional technologies – hand-plied yarn for plying, pit-looms and fly-shuttle looms for weaving, and so on – except at the spinning stage where electric operated spinning machines were employed at almost all household units.

4. Field Procedures and Questionnaire

To study the networks of the Saliyars and investigate into their insularity and social cohesion in their production and knowledge relations, we conducted fieldwork in the Saliyar cluster and the socially-more-heterogeneous cluster at Payattuvila. Data for this study were collected from September 2010 to January 2011. The unit of interview was the household unit engaged in handloom production activity, and the targeted interviewee was the member of the household engaged in production. An interpreter's support was sought for the entire study since all enquiries had to be undertaken in Malayalam. This study conducted interviews in the manner of conversation, and used a sectioned questionnaire inspired in structure by Arora (2009). The questionnaire was sliced into modules – basic information on household and production activity, professional network, social network, information network, and miscellaneous information. The professional network section requested lists of main providers of input/raw-material, consumers, and financiers; the social network section requested lists of relatives and friends who were *very* close, in that they met the respondent *everyday*, and who were the first to be approached in the event of domestic and family emergencies. The information network section requested lists of the *first* individuals or agencies the respondent would approach for business or production issues such as new consumers, new market trends, new technologies (in plying, dyeing, etc.), new designs, tastes, in other words any new piece of news on production and commercial know-how. When naming individuals or other agents, it was asked not whom a respondent simply 'knew' as a provider of the latest know-how, rather who the *first* few individuals or agents that came to mind were when the respondent was curious on the latest developments in products, production processes, designs, trends, etc. Data collection for the network questions were based on guidelines in Wasserman and Faust (1994), along with guidelines on field survey method from Rea and Parker (2005) and Yin (2003). Free recall was adopted for the three network sections, but since a complete list of actors in the Saliyar Cluster or Payattuvila Cluster was not available, a snowballing list of respondents for interview was relied upon. Free choice was adopted (as opposed to fixed choice, where respondents are told exactly how many individuals to list in their network). Given that the handloom textile

profession at the household level requires meeting clients and suppliers on an everyday basis, enquiry on strength of ties was limited.

We now map the networks of Saliyar community members who are engaged in any stage of handloom textile production, along with the networks of the communities in the Payattuvila cluster.

5. Network Analysis

Besides the Saliyars, there are three other communities (categorised along lines of caste) in the network, denoted here as Community-II, Community-III and Community-IV Actors in the network who cannot be categorised by caste – including state agencies, showrooms, shops, financiers, and media sources – are categorised as Community-NIL (in fact, most nodes in the network fall into this category). Many actors operate in locations beyond the two clusters, spread across Kerala state and India. Table 1 summarises the community and regional distribution of the 62 actors in this network.

Table 1 Distribution of actors by community and region

	Saliyar Cluster	**Payattuvila Cluster**	**Balarama-puram**	**Kerala State**	**Tamil Nadu**	**Rest of India**	**Total**
Saliyar	17	0	0	0	2	0	19
Community-II	0	7	0	0	0	0	7
Community-III	0	3	0	2	0	0	5
Community-IV	2	4	0	0	0	0	6
Community-NIL	0	3	9	5	2	6	25
Total	**19**	**17**	**9**	**7**	**4**	**6**	**62**

5.1. The networks

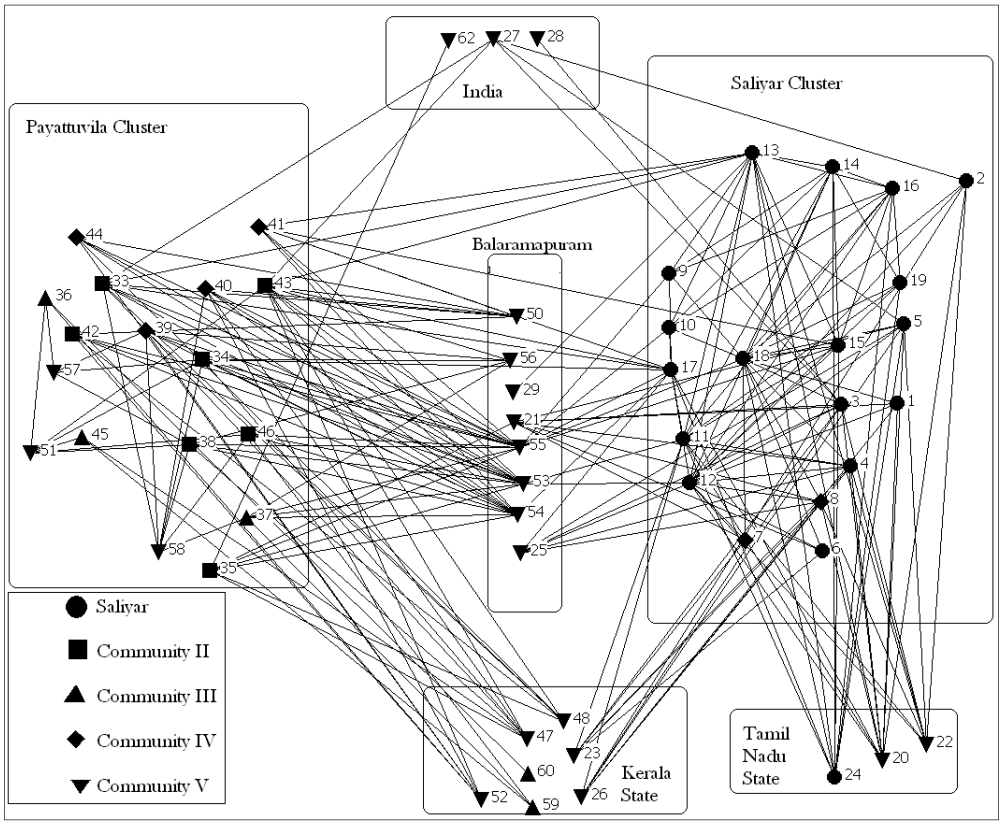
UCINET (Borgatti et al., 2011) was used to generate the network diagrams. In all three networks, actors have been grouped by location and their community has been differentiated by shape. Hence, for example, node 42 in the network diagrams that follow is a square (Community-II member) operating in the Payattuvila Cluster; node 47 is a down-triangle (Community-IV member) operating in Kerala; node 14 is a circle (Saliyar community member) operating in the Saliyar Cluster; and so on. Occupations – weavers, yarn sellers, plyers, etc. – have not been assigned attributes since it might result in some confusion in the diagrams to have nodes classified into twelve different occupational categories.

Table 2 Occupational Distribution of Actors in Each Cluster

	Weaver	**Retail & Wholesale Shop**	**Plyer**	**Yarn Shop**	**Spinner**	**Master Weaver**	**Financier**	**Cooperative**	**Total**
Saliyar Cluster	3	8	4	2	1	1	0	0	19
Payattuvila Cluster	10	0	0	0	0	4	1	2	17

Table 2 shows the occupational distribution of actors in each cluster. 'Raw Input Supplier', 'Miscellaneous Customer', 'Media Sources', and 'Others' have been excluded from Table 2 as they operate beyond the two clusters. In the course of the sections that follow, occupations of some noteworthy nodes will be revealed.

Figure 1 Professional Network



In the Professional Network (Figure 1), nodes in the Saliyar Cluster and Payattuvila Cluster may be heavily connected within, but there are also a number of dyads that span the two clusters: (13,33), (13,43), (13,41),(15,41), (17,33), (17,41), (17,43). Besides these dyads, there are a few nodes that bridge both clusters, including 21 (retail shops), 53 (plyers), 54 (yarn sellers), and 55 (yarn spinners), all in Balaramapuram. In the Information Network (Figure 2), too, a number of dyads span the two clusters: (11,46), (13,41), (17,33), (17,38), (17,39), (17,40), (17,42). Besides these dyads, nodes that bridge both clusters include 31, 47 and 48 (large retail sellers that operate across various districts in Kerala and India). Actors 47 and 48 two actors will be revisited in a later section.

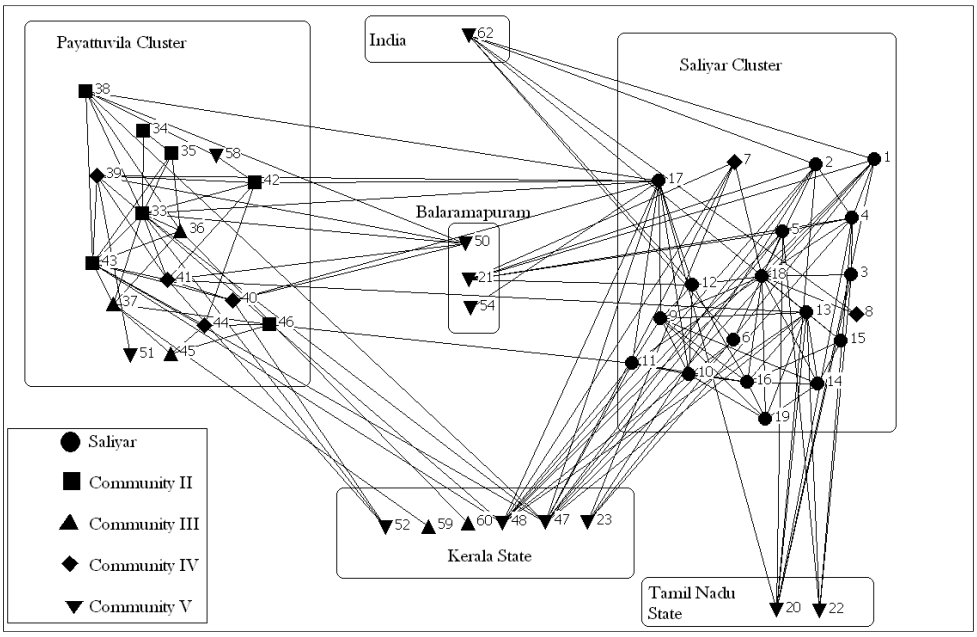


Figure 2 Information Network

The Social Network (Figure 3) is completely polarised along cluster lines. Here, the Payattuvila Cluster's community heterogeneity is noticeable.

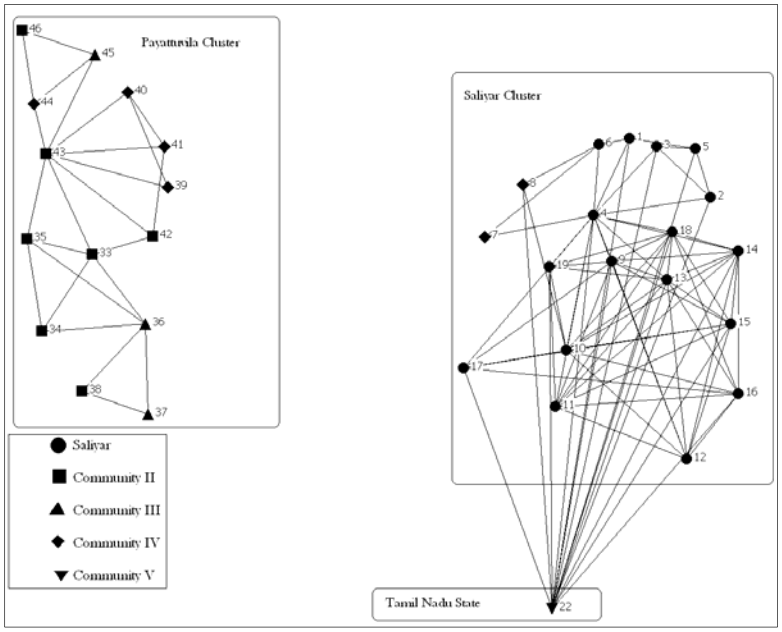


Figure 3 Social network

Node 22 in the Saliyars' social network stands out, this node referring to a few families in Nagercoil town whose inhabitants are Tamil-speaking and some of whom are even distantly related to the Saliyars. Node 4 (a Saliyar retail shop) has the highest betweenness centrality in the Saliyar Cluster while actor 43 (a Community-II master weaver at Payattuvila) has the highest betweenness centrality in the Payattuvila Cluster. Members of the two clusters know each other by name, but as explained earlier, the questionnaire requested names of relatives and friends who were *very* close.

5.2. Descriptive Observations on Homophily and Links across Regions

This section serves to describe homophily of the four communities, in order to demonstrate the nature of affinities of actors to other actors in their own community, in each of their networks. We also look at the geographic spread of each community's links. Initially we do a description, but later we use the homophily observations in discussions. We adapt measures of homophily described in Currarini et al. (2009). Homophily H_i of an actor *i* is a ratio of the number of links of actor *i* to the community she belongs (s_i), to the total number of links she possesses (s_i+d_i), including links with other communities.

$$H_i = \frac{s_i}{s_i + d_i} \qquad \text{---- [1]}$$

This measure, cautioned by Coleman (1958) and Currarini et al. (2009:1008), fails to account for group size. Instead, we use Inbreeding Homophily (IH) in Currarini et al. (2009), which normalises to control for the sizes of the different groups.

$$IH_A = \frac{H_A - W_A}{1 - W_A} \qquad \text{---- [2]}$$

H_i is the basic homophily measure in [2], while W_i is the size of the group that actor *i* belongs to. An average of the IH of all members in the group that actor *i* belongs to gives the homophily of the whole group. Group A is said to display Complete Inbreeding when IH_A=1, Pure Baseline Homophily when IH_A=0, Inbreeding Homophily when IH_A>0, and Inbreeding Heterophily when IH_A<0. We measure homophily using IH for each community (except Community-NIL, of course), and across professional, information, and social networks. The descriptive results are interesting in that they appear to support our initial propositions on the community cohesion of the Saliyars. Figure 4 shows the homophily of each community across each network.

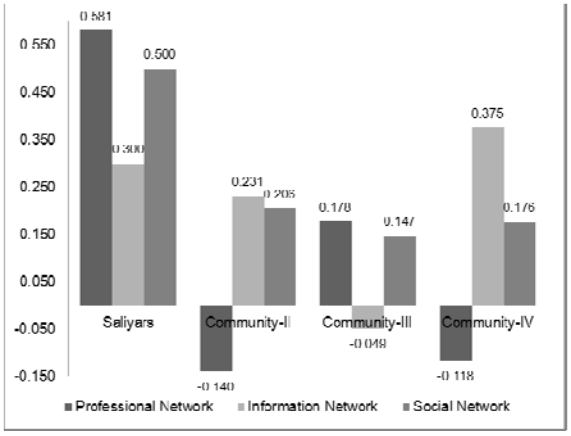


Figure 4 Homophily across communities

It can easily be seen that the Saliyars are highly homophilous in all three networks. Only the Saliyars and Community-III show professional-network homophily; the other two communities display heterophily in this network. In the information network, the Saliyars show much higher

homophily than do Communities II and III (but not Community-IV, which has a very small population). The Saliyars also show the highest homophily in their social network, by virtue of its members residing in a socially homogenous cluster.

Each community also differs in the geographical spread of their professional and information links (Table 3 and Table 4). It can be seen in Table 3 that the Saliyars are the only community maintaining more within-cluster professional links (61.2%) compared to out-of-cluster links. Disaggregating the out-of-cluster professional links, we see that the Saliyars keep around 42% of their out-of-cluster professional links with Tamil Nadu (particularly with Nagercoil town), i.e., to their own community members living there. Saliyars appear to prefer homophilous connections even in their out-of-cluster links.

Table 3 Geographical Distribution of Professional Links

Community	**Proportion of Links within Cluster** (%)	**Proportion of Links outside Cluster** (%)	**Disaggregated Out-of-Cluster Professional Links** (% of professional links outside cluster)			
			Balaramapuram Town	Kerala State	Tamil Nadu	Rest of India
Saliyars	61	39	30.70	20.85	42.54	5.91
Community II	16	83	67.28	28.14	0	4.58
Community III	33	67	33.33	66.67	0	0
Community IV	19	81	64.19	30.24	5.57	0

In their information links, all communities maintain more within-cluster than out-of-cluster links (Table 4), of which Community-IV maintains the highest out-of-cluster information links. Interestingly, the Saliyars seem to maintain the lowest within-cluster information links. But this is not surprising since on disaggregating the out-of-cluster information links we observe that around a fifth of the Saliyars' out-of-cluster information links are with Tamil Nadu – once again, with their own community members living in Nagercoil town.

Table 4 Geographical Distribution of Information Links

Community	**Proportion of Links within Cluster** (%)	**Proportion of Links outside Cluster** (%)	**Disaggregated Out-of-Cluster Information Links** (% of information links outside cluster)			
			Balaramapuram Town	Kerala State	Tamil Nadu	Rest of India
Saliyars	56.1	43.9	13.11	40.22	21.76	24.91
Community II	79.3	20.7	32.17	61.72	0	6.11
Community III	61.9	38.1	49.99	49.99	0	0
Community IV	91.7	8.3	0	66.65	0	33.35

5.3. Embeddedness and Path Lengths to Influential Information Actors

We turn now to the issue of embeddedness. We are interested in the extent to which a community's production and information networks are embedded in its social networks. This, along with the previous section on homophily, addresses the social cohesion of the Saliyars. To anticipate

the results, the Saliyars appear to be much more cohesive than other groups, prompting the argument that their excessive social cohesion caused their decline.

Before enquiring about the magnitude of embeddedness of each community, we perform a correlation to test the association of the social network with the professional and information networks individually. The test of the extent to which one network resembles another is a correlation between the adjacency matrices of these networks. This test is required because calculating confidence bounds on a correlation of adjacency matrices is not straightforward due to the interdependence both among cells of the matrix and among different properties of the nodes (Krackhardt 1987; Arora 2009). A standard technique in network analysis for generating confidence intervals is the Quadratic Assignment Procedure (QAP). QAP is a permutation text which in essence generates a distribution of a statistic according to some null hypothesis, by permuting rows and columns (simultaneously) of one of the matrices, consistent with the null hypothesis. This creates a frequency distribution of the test statistic, which is taken as an estimate of the true underlying distribution. This permits estimation of confidence intervals around the observed statistic. Results of the QAP test on the correlations of the social network with the professional and business networks are given in Table 5.[11]

Table 5 QAP Correlation Results

	Pearson Correlation	**Significance**	**Average Random Correlation**	**s.d.**	**Percentage (Larger)**
Professional Network Matrix	0.195	0.000	0.000	0.025	0.000
Information Network Matrix	0.397	0.000	0.000	0.026	0.000

Table 5 indicating the Pearson Correlation shows the observed value of correlation between the social network matrix and the other two network matrices individually, 0.195 and 0.397. The Average Random Correlation is simply the mean value of the correlations between the professional (information) network and each of the permuted social networks. In both cases, mean correlation is zero, with a standard error (SD) of only 0.025 and 0.026 respectively. The number of random correlations that were larger than 0.195 and 0.397 was zero, as shown in the 'Percentage (Larger)' column, i.e., none of the 5000 random permutations produced a correlation higher than 0.195 or 0.397 for the respective matrices. With these results, we can say that the correlation between the social network matrix and the professional- and information-network matrices, respectively, is statistically significant, and the correlations between these matrices are unlikely to have occurred by chance.

To address the same issue, we can define embeddedness directly. Here we follow Arora (2009:154).

[11] The correlation between two matrices is simply the correlation between elements of the adjacencies matrices. The element *ij* of an adjacency matrix takes the value 1 if *i* and *j* are linked in that network, 0 otherwise.

$$\textit{Social Embeddedness of Production Network} = \frac{\sum_{ij} P_{ij} S_{ij}}{\sum_{ij} P_{ij}} \qquad \text{---- [3]}$$

$$\textit{Social Embeddedness of Information Network} = \frac{\sum_{ij} K_{ij} S_{ij}}{\sum_{ij} K_{ij}} \qquad \text{---- [4]}$$

P_{ij}, K_{ij} and S_{ij} are the adjacency matrices of the production network, information network, and social network respectively. An element in P_{ij} (equivalently K_{ij} and S_{ij}) takes the value 1 if *i* and *j* are professionally (or for information or socially) connected and 0 otherwise. If two actors are connected both by a production link as well as a social link, their professional network link is said to be socially embedded, and likewise for their information network link. Table 6 shows these measures of embeddedness for the different communities.

Table 6 Social Embeddedness of each Community

	Professional Network	**Information Network**
Saliyars	0.379	0.456
Community II	0	0.544
Community III	0	0.500
Community IV	0.456	0.278

The Saliyar community displays a significant amount of social embeddedness in its professional network (just as it was one of the only two communities displaying professional network homophily). But what is striking, and apparently discordant with the observations on homophily, is that the Saliyars show *lower* information-network embeddedness than Community-II and Community-III.

The embeddedness statistics give a mixed message: professionally the Saliyars seem to operate within their social network, but when it comes to accessing information they appear less embedded than two other communities. This suggests that the social cohesion they display should not be an impediment to accessing and adopting the latest information or technology.

The measure may be too crude. Information flows between randomly selected pairs of agents may be much less important than flows from particular agents. If some agents are better informed or closer to the knowledge frontier then what is important for success of any agent is his or her ability to receive information from that agent. We can estimate this for a group by the proximity of each community to nodes in the network that are influential as trendsetters in the handloom industry. Examining proximity to more well-informed actors or groups is important, as the adoption of better know-how is a function of the distance of an agent from the 'frontier of technological possibilities' (Malerba et al., 2001) and short path lengths are known to be conducive to fast and effective diffusion of information in a network, and thus to progress in its aggregate knowledge growth (Cowan, 2004).

We identify in our network two major influential information actors (IIA): two successful upmarket retail showrooms, actors 47 and 48, recognised by industry and the state government as being at the forefront and cutting edge of design and innovation in the handloom industry in Kerala (GoK, 2007:21). For path length, we rely upon a simple measure of geodesic distance, in this case the distance from an actor to nodes 47 and 48. We compute a simple mean of the distance to both these nodes for each actor in a group. This individual-actor measure is averaged across all actors in the group to obtain the mean path length of the group to the IIA (Table 7).

Table 7 Mean Path Length to Influential Information Actors (IIA) of each Community

	Mean Path Length to IIA
Saliyars	1.68
Community II	1.71
Community III	2.33
Community IV	2.08

This shows that the Saliyars are, on average, more closely connected to the important information actors than are the other groups and that they should actually have better access to new information than the other communities. This is an industry where growth and progress are based on quick access to fresh information on new consumers, new market trends, and the latest developments in products, processes and designs. The Saliyars' proximity to influential agents who can provide this sort of information should ideally provide a competitive advantage, and should support the long term viability of the community. But the story has been different.

Our initial argument was that a community exhibiting strong homophily and strong embeddedness would find itself at a competitive disadvantage over time, as the 'global' technology (broadly defined) passed them by. The Saliyar community has made a transition from the most advanced and influential group of weavers to a community in which weaving has become a marginal activity. If homophily and social embeddedness have played a role, it is demands a more subtle examination.

5.4. A Measure of Joint Cohesion

Conceptually, both embeddedness and homophily draw from the same root — that one cannot perceive business networks and production relations among economic actors as separate from their social relations. But social relations are not monolithic, and can differ on the basis of embeddedness and homophily. An agent's production (or information) link may be overlapped by her social link (i.e., it may be embedded), but this need not be homophilous. Similarly, her homophilous production (or information) link may not be socially embedded. We therefore have four kinds of cohesion:

(1) **Non-Homophilous Non-Embedded**, when an agent's link is neither homophilous nor embedded.

(2) **Embedded but Non-Homophilous**, when an agent's socially-embedded link is non-homophilous.

(3) **Homophilous but Non-Embedded**, when agent's homophilous link is not socially embedded.

(4) **Homophilous-Embedded** occurs when an agent's socially-embedded link is homophilous.

This demonstrates that there is a spectrum of cohesion along which links can be categorised. We would expect that homophilous-embedded links are more detrimental in the long run than the other three types, since they draw the combined deteriorative effects of both embeddedness and homophily, while other types of cohesion may bring in deteriorative effects of only embeddedness or only homophily, or sometimes neither. It follows that one must beware not only over-embeddedness, but also its combined effect with homophily.

The literature on embeddedness and homophily has not entirely ignored this, as briefly mentioned at the end of section 2.2, but has not articulated it very clearly either. Schnell and Sofer (2002) recognised that social links are combinations of various elements such as kinship, a supportive tissue, and so on, and not just one monolithic entity. McPherson et al. (2001) acknowledged that among the various social ties, homophilous and ethnic ties create the strongest divisions; in a way, recognising the need to disentangle 'social ties' into its various flavours. To repeat, Gulati (1998) recalled from Zukin and DiMaggio (1990), facets of embeddedness as having consequences for strategic alliances, independently and together, which need to be examined. These facets — institutional, cultural, and political elements — are to be used to define embeddedness of firms in a more definitive sense than simply 'social relationships'. And Moody and White (2003) mentioned how the exact meaning of 'cohesion' is left vague, and how, like 'solidarity', 'embeddedness' is multidimensional. The literature has many such calls for the disentangling of social relations, and this study contributes by demonstrating through the case of the Saliyars, the vastly different effects of homophilous-embeddedness and non-homophilous-embeddedness, from merely 'embeddedness' or 'homophily'. The Saliyars may have declined not simply because they were homophilous or embedded but due to the combined effect of their homophilous embeddedness.

We measure these four kinds of cohesion in our networks. Table 8 and 9 show a 'truer' picture of cohesion and compared with Table 6 there is significant change, demonstrating how important these joint measures are in truly assessing a group's cohesiveness.

Table 8 Proportion of Cohesive Links in Professional Network

	Least Detrimental **Non-Embedded & Non-Homophilous**	*>>>* **Non-Embedded but Homophilous**	*>>>* **Embedded but Non- Homophilous**	*Most Detrimental* **Homophilous-Embedded**
Saliyars	30.10%	31.67%	0.66%	**37.24%**
Community II	100%	0%	0%	0%
Community III	51.67%	48.33%	0%	0%
Community IV	97.90%	0%	2.08%	0%

Table 9 Proportion of Cohesive Links in Information Network

	Least Detrimental **Non-Embedded & Non-Homophilous**	>>> **Non-Embedded but Homophilous**	>>> **Embedded but Non- Homophilous**	*Most Detrimental* **Homophilous-Embedded**
Saliyars	23.68%	30.25%	0%	**46.07%**
Community II	39.35%	6.22%	20.85%	33.57%
Community III	22.22%	27.78%	38.89%	11.11%
Community IV	67.74%	4.46%	22.38%	5.42%

Each figure in the tables shows the percentage of cohesive links among all links in the respective network.[12] Most links by Saliyars in their professional or information networks are homophilous-embedded category; also, they possess the largest proportion of these highly detrimental links even among the four communities. So in either way, they are the most cohesive community.

The final task is to test whether there is a significant difference in the proportion of homophilous-embedded links between weavers and non-weavers in professional and information networks. Table 10 shows the proportion of homophilous-embedded links between weavers and non-weavers in the two clusters. A Welch two-sample t-test, performed to check whether the differences in means between these categories are statistically significant, shows affirmative results.

Table 10 Proportion of Homophilous-Embedded Links between Weavers and Non-Weavers

	Professional Network	**Information Network**
Weavers	11.43%	25.09%
Non Weavers	24.82%	37.50%

With this, we can ascertain that it is indeed their excessive *cohesion* – their predominantly homophilous-embeddedness links, and not just their embeddedness or homophily alone – that is leading the Saliyars to operate in stages of handloom production other than weaving.

6. Social Capital and Inherited Links

What stops an individual in the Saliyar community from amending his or her links, especially when there is no animosity among communities? The reason lies in the community's perception of its social capital. The Saliyars treat their social capital almost as 'ethnic' capital; many in this community strongly believing that weaving is "in their genes" and a matter of "community pride". We know from the literature that norms and obligations are deep-seated elements in the everyday economic functioning of communities. Inherited production links cannot be broken easily and attempts to do so may be socially expensive since it may involve tampering with community relations and with

[12] Figures, between degree of cohesion within each community, were found to be significantly different from one another when a difference in means test was applied.

investments made in the past by the community to maintain social ties and obligations specifically for economic purposes (Coleman, 1988; Borjas, 1992, 1995). 'Cultural values', which often materialise themselves in economic links, are often transferred across generations purely for their survival and preservation (Wintrobe, 1995; Dasgupta, 2005). Many Saliyars reported that links are ingrained into them as they grow up familiarising with suppliers and consumers (essentially members of their own community) arriving at home everyday, since childhood. The baggage of loyalty and communal obligation is relayed generation after generation, 'locking them in' from birth (Dasgupta, 2005). Information on links seems to have been directed by tradition, just as in a network 'clan' (Bianchi and Bellini, 1991). The Saliyars have recognised all this, evident during interviews, and it is out of this recognition that they proudly explain that many in the younger generation of Saliyars have dissociated with any stage of handloom and migrated out of Balaramapuram town. In fact, during the survey many respondents spoke with pride about how their children "cannot remain weavers in these precarious times" and have hence "settled very successfully in life" as doctors, engineers, and in other professions. Interestingly, despite the encouragement to move to other professions, most children were taught the basics of weaving at home during childhood since these skills are still treated as their community's heritage, even if not a lucrative career option. But not a single Saliyar family we interviewed expected or encouraged their children to continue in the profession.

Some expected problems with cohesive communities and ethnic enclaves – such as free riding associated with the public good nature of social capital, or isolation due to a different language – seem to have been bypassed in the case of the Saliyars. Free riding associated with the public good nature of social capital was averted due to a strong presence of numerous closed networks within the community (note the many triangles in the Saliyars' networks in Figures 1, 2 and 3), and consequently the inescapable monitoring of each individual by the community. Also, both Malayalam and Tamil languages are freely spoken by the majority of the population in an inter-state border region such as Balaramapuram town, which is populated by many native (non-Saliyar) Tamil speakers.

The ultimate solution among the Saliyars to escape their inherited lock-in seems to have been to move away from handloom textile production altogether. The Saliyars seemed to have judged that it is probably not a good idea to continue relying upon their social capital given their severely entrenched cohesion.

It is not the case that handloom is an unprofitable industry. The ongoing success of the Payattuvila Cluster and many other such clusters in Balaramapuram town and Trivandrum district show that handloom (though plagued with numerous other problems such as competition from powerloom, unorganised production, defunct cooperatives, etc.) is not a sick industry and has enjoyed a modest and stable level of success[13], having also acquired a GI tag for the Balaramapuram *sari* and

[13] This is reflected in the total value of handloom production in Kerala over the years 2000 to 2008 (GoK, 2010, and others).

for four other textile products, and catering to a strong product demand state-wide and in upmarket showrooms across India. Recalling Grabher's (1993b) account of the Ruhr (see section 2.2), shortcomings in the industry, if any, affect not just one group but all actors, and at times it is excessive cohesiveness among certain members that is at fault. The literature demonstrates that a unit's (or for that matter an industry's) failings may not be organisational, but due to its position and affiliation to a cohesive and rigid network (Walker et al., 1997) – this seems to apply well to the Saliyars.

7. Conclusions

The idea of social relations shaping business and production relations between economic agents is not new, and these relations are often characterised by embeddedness and homophily. We have studied the Saliyars of Balaramapuram who have exhibited cohesion to such an extent that it has marginalised their community cluster in the overall scheme of production and knowledge exchange relations in the Balaramapuram handloom clusters. Lessons drawn from this cluster's experience show social embeddedness in combination with thick homophily in production and information networks can fuel the decline of a community. Through this network analysis we have provided evidence that it is not just embeddedness or homophily alone, but cohesion in its full sense that is detrimental. The conceptual ambit of embeddedness has to broaden to recognise that embedded social relations are influenced by homophily. While assessing their business and information networks, agents must be cautious about being not only over-embedded but also whether their embedded links are homophilous.

Attempts by units or clusters to bridge structural holes for new information links must not neglect this. For policy too, this recognition is extremely important. First, it calls for the attention of policymakers to recognise that informal knowledge exchanges between units along their social networks is a significant channel of knowledge diffusion in traditional technology clusters. Second, incentives, in the form of links suggested by the State to these actors for business and technology improvement, must be shaped with the recognition of social *cohesion*. In India, where community relations are the driving force in many industries – especially in traditional technology industries – and where social capital drawn on the lines of caste and community still prevail (even if not out of antagonism), this recognition is imperative. Monetary schemes and packages, export oriented incentives, and so on, are vital to the handloom industry. But region specific network studies, especially of small pockets like the Saliyar Cluster, would provide new revelations at the micro and meso level of the industry that would assist in region-specific policies. Network analysis today takes on a leading role in management and industry studies, in sociological studies, and in many other fields (Barabási, 2003) but it must seep into Indian policymaking as well.

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